Meteorological Post Processing Documentation and Task Lists for 2019/2020

McMurdo Dry Valley Long Term Ecological Research (LTER)

This document compiles the steps taken to post-process raw meteorological data files and notes from station visits. Each numbered output value is identified by column header name, unit of measurement, and post-processing instruction. Station notes document datalogger time adjustments, sensor status, sensor and station maintenance, time of storage module changes, equipment and data problems, and other observations. Files are listed alphabetically by file name that begin with the station ID.

Station Reports

Lake Bonney Met Station (BOYM) 4

Lake Brownworth Met Station (BRHM) 6

Canada Glacier Met Station (CAAM) 9

Explorers Cove Met Station (EXEM) 8

Commonwealth Glacier Met Station (COHM) 9

Mt. Fleming Met Station (FLMM) 22

Lake Fryxell Met Station (FRLM) 12

Friis Hills Met Station (FRSM) 13

New Lake Hoare Met Station (HO2M) 14

Howard Glacier Met Station (HODM) 16

Miers Valley Met Station (MISM) 17

Taylor Glacier Met Station (TARM) 19

Lake Vanda Met Station (VAAM) 19

Lake Vida Met Station (VIAM) 20

Appendix

Array I.D. key

Date of Establishment

Prepared by: Krista Myers, 2019-20 Field Season, Louisiana State University

Sensors:

See below for list of sensors currently used on McMurdo LTER meteorological stations

Sensor Type	Manufacturer	Model Number
Air Temperature	Campbell	107
Relative Humidity	Vaisala	HMP45C
Wind (anemometer)	RM Young	05103
Shortwave radiation (pyranometer)	Licor	LI-200R
Shortwave radiation (pyranometer)	Eppley	SPP
Photosynthetically Active Radiation (PAR)	Licor	LI-190R
Longwave radiation (pyrgeometer)	Eppley	PIR
Soil Temperature	Campbell	107
Ultrasonic Ranger	Campbell	SR-50
Barometer	Vaisala	CS106
Soil moisture	Decagon	ECH20 5TM
Datalogger	Campbell	CR10X

File description and task list for files:

o1=omit from level 1
ok= no changes to get to level 1
rclow= reverse temperatures to mV and apply clow subroutine to mV values using Steinhart-Hart equation
bad= normally would be included in level 1 but number is suspect or know to be incorrect
flag= reasonable number but needs a note attached concerning its collection
Lowe= see note for relative humidity below

Data Flags

Definition	Flags	Post-processing	Data Manager
Out of Range	R	None	Flag as R, except flag as "U" when IceT20cm exceeds 0 degrees and "V" when IceT1m exceeds 0 degrees
Negative values zeroed out	Z	Converted to zero	Flag as Z
Bad Value - Value below zeroing value	T	Value omitted	Flag as F
Bad Value - Value is equal to -6999 or known to be questionable	B	Value omitted (changed 2018)	Flag as B
Bad Value - Raw temp value (-53C and 32.79C) which exceeds the bracketed limited for bisection	F	Value omitted	Flag as B
SwRadOut is greater than a % of SwRadIN	S	None	Flag as S
Wdir and WDirStD zeroed out because WSpd = 0	N	Converted to zero	Flag as N
Value missing	M	None	Flag as M

Relative humidity correction note: All of the relative humidity (RH) values were corrected for a systematic error in the measurement created by an instrument manufacturer error. All RH data with air temperatures below freezing were corrected using the vapor pressure over ice (rather than over water which was used initially). The error became quite large for very cold temperatures (the correction could grow to around 30%). The polynomials used for the correction is based on Lowe (1977).

=[RH3m]*(6.107799961 + [AirT3m] * (0.4436518521 + [AirT3m] * (0.01428945805 + [AirT3m] * (0.0002650648471 + [AirT3m] *(0.000003031240396 + [AirT3m] * (0.00000002034080948 + 0.000000000006136820929 * [AirT3m])))))) / (6.109177956 + [AirT3m] * (0.503469897 + [AirT3m] * (0.01886013408 + [AirT3m] * (0.0004176223716 + [AirT3m] * (0.00000582472028 + [AirT3m] * (0.00000004838803174 + 0.000000000001838826904 * [AirT3m])))))))

Relative Humidity values are capped between 0 to 100%. Any values that fall outside of this range are flagged as ‘R’.

Lake Bonney Met Station (BOYM)

Filename:	BOYM_201920_PROCESSED_noPAR_noLwRad.csv
Author of this report:	Krista Myers
File Period:	11/17/2018 16:00 to 11/12/2019 17:30
Sampling Frequency:	sonic and prec. every 60 minutes, wind speed every 4 sec, other every 30 sec
Averaging and Output Interval:	every 15 minutes
Program Name:	BOYM_201718_V1.dld

1	array I.D.	o1
2	Year	ok
3	Day	ok
4	Time	ok
5	mean air temp. @ 3 meters (C)	rclow
6	corrected mean R.H. @ 3 meters (%)	Lowe correction
7	mean air temp. @ 1 meters (C)	rclow
8	mean solar flux; incoming (up-facing) (W/m2) **Licor pyranometer; SN: PY25306**	ok
9	mean solar flux; outgoing (down-facing) (W/m2) **Licor pyranometer; old SN: PY28170, new SN: PY20222**	ok
10	mean horizontal wind speed (m/s)	ok
11	resultant mean wind speed (m/s)	o1
12	resultant mean wind direction (degrees from north)	ok
13	standard deviation of wind direction (degrees)	ok
14	maximum wind speed (m/s) **RM Young; SN: WM85155**	ok
15	minimum wind speed (m/s)	ok
16	mean P.A.R. (micromols/s/m2) **Licor quantum; SN: Q11725**	***Missing calibration sheet for Q11725 – will process data once found***
17	mean soil temperature @ 0 cm in soil (C)	rclow
18	mean soil temperature @ 5 cm in soil (C)	rclow
19	mean soil temperature @ 10 cm in soil (C)	rclow
20	sample depth from sensor to surface (cm)	Measured depth * -100
21	mean up-facing pyrgeometer, rad. comp. (W/m2) ***Eppley data not reliable - removed***	***Removed***
22	mean up-facing pyrgeometer2 (W/m2) ***Eppley data not reliable - removed***	***Removed***
23	mean down-facing pyrgeometer, rad. comp. (W/m2) ***Eppley pyrgeometer not working - removed***	***Removed***
24	mean down-facing pyrgeometer2 (W/m2) ***Eppley pyrgeometer not working - removed***	***Removed***
25	sample precipitation (mm)	ok
26	sample of battery voltage	o1

Notes:

- Station visited on 11/12/2019 by K. Myers, M. Myers and M. Stone. All input values looked good.
- Power off at 17:35; power on at 19:10.
- Replaced downward facing Licor pyranometer (old SN: PY28170, new SN: PY20222)
- Replaced upward facing Eppley pyranometer in 2018 (new SN: 37501F3). This may have been a mistake, because station is supposed to have long wave radiation, not short wave. Not publishing upward Eppley pyranometer data this year.
- Replaced Campbell SM4M storage module (P8: BOYM_201718_V1.dld)

- Removed downward facing Eppley Pyrgeometer + cable in 2018 – no data.
- Relative Humidity sensor installed on 11/17/2018 is not working properly – recording negative numbers. Will need to replace next season.

Lake Brownworth Met Station (BRHM)

Filename:	BRHM_201920_PROCESSED_noWindDir.csv
Author of this report:	Krista Myers
File Period:	12/22/2018 14:15 to 12/29/2019 09:45
Sampling Frequency:	sonic every 60 minutes, wind speed every 4 sec, other every 30 sec
Averaging and Output Interval:	every 15 minutes
Program Name	BRHM_201112_v1

1	array I.D.	o1
2	year	ok
3	day	ok
4	time	ok
5	mean air temp. @ 3 meters (C)	rclow
6	corrected mean R.H. @ 3 meters (%)	lowe correction
7	mean solar flux; incoming (up-facing) (W/m^2) **Licor pyranometer; old SN: PY20567, new SN: PY51355**	ok
8	mean solar flux; outgoing (down-facing) (W/m^2) **Licor pyranometer; old SN: PY28347, new SN: py28371**	ok
9	mean horizontal wind speed (m/s)	ok
10	resultant mean wind speed (m/s)	ok
11	resultant mean wind direction (degrees from north)	o1
12	standard deviation of wind direction (degrees)	ok
13	maximum wind speed (m/s)	ok
14	minimum wind speed (m/s)	ok
15	mean P.A.R. (micromols/s/m^2) – **Licor quantum; SN: Q09916**	ok multiply by 1.379690949 (Q09916)
16	mean soil temperature @ 0 cm in soil (C)	rclow
17	mean soil temperature @ 5 cm in soil (C)	rclow
18	mean soil temperature @ 10 cm in soil (C)	rclow
19	sample depth from sensor to surface (cm)	measured depth * -100
20	sample of battery voltage	o1

Notes:

- Station visited on 12/29/2019 by M. Stone and W. Gutterman. All input values looked good, except for ultrasonic.
- Power off at 09:58, Power on at 11:34.
- Replaced ultrasonic transducer. Measured distance from ultrasonic to ground = 59.5 cm. Ultrasonic ranger still not working.
- Replaced upward facing Licor pyranometer, SN: PY51355 – need to confirm serial number when removing, hard to read notes.
- Replaced downward facing Licor pyranometer, SN: PY28371
- Installed a new 12V battery.
- Replaced Campbell SM4M storage module (P8: BRHM_201112_V1.dld)
- Wind monitor angle might was not pointing true north. Wind monitor was rotated 30 degrees counterclockwise. Will need to correct data to account for this change. Data not reported for now.

Canada Glacier (CAAM)

Filename:	CAAM_201920_PROCESSED.csv
Author of this report:	Krista Myers
File Period:	11/27/2018 15:45 to 12/28/2019 11:45
Sampling Frequency:	wind speed every 4 sec; all other every 30 sec
Averaging and Output Interval:	every 15 minutes
Program Name	CAAM_201011.V1

1	array I.D.	o1
2	Year	ok
3	Day	ok
4	Time	ok
5	mean air temp. @ 3m (C)	rclow
6	corrected mean relative humidity (%)	Lowe correction
7	Aspirated mean air temp @ 3m (C)	rclow
8	mean solar flux; incoming (up-facing) (W/m^2) **Licor pyranometer; old SN: PY28349, new SN: PY56364**	ok
9	mean solar flux; outgoing (down-facing) (W/m^2) **Licor pyranometer; old SN: PY23271, new SN: PY27929**	ok
10	mean horizontal wind speed (m/s) **Anemometer; old SN: WM31283, new SN: WM15188**	ok
11	resultant mean wind speed (m/s)	o1
12	resultant mean wind direction (degrees from north)	ok
13	standard deviation of wind direction (degrees)	ok
14	maximum wind speed (m/s)	ok
15	minimum wind speed (m/s)	ok
16	mV_therm_average	o1
17	mV_tpile_AVG	o1
18	Ice surface temp (C)	ok
19	sample battery voltage	o1

Notes:

- Station visited on 12/28/2019 by W. Gutterman, M. Stone, and R. Moyer. All input values looked good.
- Power off at 11:51, power on at 13:31
- Replaced upward Licor pyranometer (old SN: PY28349, new SN: PY56364)
- Replaced downward Licor pyranometer (old SN: PY23271, new SN: PY27929)
- Replaced anemometer (old SN: WM31283, new SN: WM15188)
- Replaced CR10X datalogger (old SN: X09315, new SN: X23165)
- Station lowered by average ~14.7 cm and levelled.
- Downward facing pyranometer ~66.5 cm from ice before station was lowered
- Replaced Campbell SM4M storage module (P8: CAAM_201011_V1.dld)

Commonwealth Glacier Met Station (COHM)

Filename:	COHM_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	11/27/2018 13:00 to 12/28/2019 14:00
Sampling Frequency:	sonic every 60 minutes, wind every 4 secs.; other every 30 secs.
Averaging and Output Interval:	every 15 minutes
Program Name:	COHM_201314_v1

1	array I.D.	o1
2	Year	ok
3	Day	ok
4	Time	ok
5	mean air temp. @ 3 meters (C)	rclow
6	mean R.H. @ 3 meters (%) **Vaisala HMP45AC; SN: V1110042**	lowe correction
7	mean air temp. @ 1 meters (C)	rclow
8	mean solar flux; incoming (up-facing) (W/m^2) **Eppley PSP pyranometer; SN: 35071F3**	divide by 100; multiply by 135.50
9	mean solar flux; outgoing (down-facing) (W/m^2) **Eppley PSP pyranometer; SN: 30853F3**	divide by 100; multiply by 132.63
10	mean horizontal wind speed (m/s)	ok
11	resultant mean wind speed (m/s)	o1
12	resultant mean wind direction (degrees from north)	ok
13	standard deviation of wind direction (degrees)	ok
14	maximum wind speed (m/s)	ok
15	minimum wind speed (m/s)	ok
16	mean incoming IR pyrgeometer output (pins A-B) (W/m^2) – **Eppley pyrgeometer; SN: 32348F3**	divide by 250; multiply by 262.47
17	mean incoming IR pyrgeometer output2 (W/m^2) – **Eppley pyrgeometer; SN: 32348F3**	Calculated using hemisphere temp (pins A-C), thermophile output (pins F-G), and case temp (pins E-D)
20	mean outgoing IR pyrgeometer output (pins A-B)(W/m^2) – **29786F3**	divide by 250; multiply by 276.24
21	mean outgoing IR pyrgeometer output (W/m^2) – **29786F3**	Calculated using hemisphere temp (pins F-G), thermophile output (pins A-C), and case temp (pins E-D)
22	ice temperature @ 50cm (original depth, mV*0.01)	No longer recording
23	ice temperature @ 100cm (original depth, mV*0.01)	No longer recording
24	IRT thermistor (mV)	o1
25	IRT raw ice surface temp mV	o1
26	Surface Temperature (C)	ok
27	sample depth from sensor to surface (cm)	measured depth* -100
28	sample of battery voltage (V)	ok

Notes:

- Station visited on 12/28/2019 by M. Stone, W. Gutterman, and R. Moyer. All input values looked good.
- Power off at 14:06, power on at 15:12
- Eppley pyranometer (downward facing) measured to be 81 cm to ice before lowering, 71.5 cm to ice after lowering
- Eppley pyrgeometer (downward facing) measured to be 80 cm to ice before lowering, 74 cm to ice after lowering
- Replaced Campbell SM4M storage module with same program (P8: COHM_201314_V1.dld).
- Station lowered by 10 cm average and levelled.

Explorers Cove Met Station (EXEM)

Filename:	EXEM_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	12/20/2018 11:45 to 1/7/2020 11:00
Sampling Frequency:	prec every 60 minutes, wind every 4 secs.; others: every 30 secs.
Averaging and Output Interval:	every 15 minutes
Program Name:	EXE1819V1.dld

1	array I.D.	o1
2	year	ok
3	day	ok
4	time	ok
5	mean air temp. @ 3 meters (C)	rclow
6	mean RH @ 3 meters	lowe correction
7	mean solar flux; incoming (up-facing) (W/m^2) **Licor pyranometer; old SN: PY23277, new SN: PY41099**	ok
8	mean solar flux; outgoing (down-facing) (W/m^2) **Licor pyranometer; old SN: PY41090, new SN: PY28348**	ok
9	mean horizontal wind speed (m/s) **RM Young Anemometer; SN: WM15361**	ok
10	resultant mean wind speed (m/s)	o1
11	resultant mean wind direction (degrees from north)	ok
12	standard deviation of wind direction (degrees)	ok
13	maximum wind speed (m/s)	ok
14	minimum wind speed (m/s)	ok
15	mean P.A.R. ($mmols/s/m^2$) **Licor quantum; SN: Q33906**	divide by 200, multiply by 295.65 (Q33906)
16	mean soil temperature @ 0 cm (C)	rclow
17	mean soil temperature @ 5 cm (C)	rclow
18	mean soil temperature @ 10 cm (C)	rclow
19	sample precipitation (mm)	ok
20	sample battery voltage (V)	ok
21	Soil moisture (volumetric water content, m^3/m^3)	ok
22	Soil temperature, measured by soil moisture probe (C)	ok

Notes:

- Station visited on 12/29/2019 by M. Stone and W. Gutterman. All input values looked good.
- Power off at 13:21, power on at 15:29.
- Replaced upward facing Licor pyranometer (old SN: PY23277, new SN: PY41099). Difficult to read new SN in field notes, need to confirm.
- Replaced downward facing Licor pyranometer (old SN: PY41090, new SN: PY28348)
- Replaced Vaisala relative humidity probe (old SN: W4230011, new SN: V1140043)
- Replaced anemometer (old SN: WM15361, new SN: WM17645). New wind monitor installed on 12/29/2019 does not appear to be working. Need to replace.
- Replaced CR10X datalogger (old SN: X44102, new SN: 28584)
- Replaced (1) 12V Battery that was from 2012.
- Soil moisture probe does not appear to be working properly.

- Downloaded camera data and updated program to camera so that it didn't have the data limit like before (it had stopped writing images in March 2019)
- New SM4M had wrong program (most recent program not documented correctly); SM4M not replaced – Dec. 29
- New SM4Ms had wrong programs and neither worked (we did not have the right version of the new program; we had EXE1819_V1.dld and EXE1819_V2.dld, and the existing program was EXE1819V1.dld without an underscore) – Dec. 31
- Station visited a second time on January 7th, 2020.
- Brought field laptop and generator, downloaded data from existing SM4M in field, cleared data but kept the program on the SM4M, reinstalled SM4M with existing program (P8: EXE1819V1.dld)

Mt. Fleming Met Station (FLMM)

Filename:	FLMM_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	12/18/2018 16:15 to 12/27/2019 15:15
Sampling Frequency:	wind every 4 sec; others: every 30 sec
Averaging and Output Interval:	every 15 min
Program Name:	FLMM_201213_V2.dld

1	array I.D.	o1
2	Year	ok
3	Day	ok
4	Time	ok
5	AirT2m (C)	ok
6	RH1.3m (%)	Lowe correction
7	wspd_U_WVT (m/s)	ok
8	wspd_U_WVT (m/s)	o1
9	WDir DU (degrees)	ok
10	WDir Std Dev	ok
11	WSpd Max (m/s)	ok
12	WSpd Max (m/s)	ok
13	Pressure (mbar)	ok
14	Voltage	o1

Notes:

- Station visited on 12/27/2019 by M. Stone, W. Gutterman, and R. Moyer. All input values looked good.
- Power off at 15:26, power on at 15:31
- Replaced anemometer (old SN: Y2820009, new SN: Z1340106)
- Replaced Campbell SM4M storage module, same program P8: FLMM_201213_V2.dld

Lake Fryxell Met Station (FRLM)

Filename	FRLM_201920_PROCESSED_noPAR.csv
Author of this report:	Krista Myers
File Period:	12/6/2018 14:00 to 12/19/2019 13:00
Sampling Frequency:	sonic every 60 min, wind every 4 sec; others: every 30 sec
Averaging and Output Interval:	every 15 min
Program Name:	FRL_201112_v2

1	array I.D.	o1
2	Year	ok
3	Day	ok
4	Time	ok
5	mean air temp. @ 3 meters (C)	rclow
6	mean RH @ 3 meters **Vaisala HMP45AC; SN: U2730007**	lowe correction
7	mean solar flux; incoming (up-facing) (W/m^2) **Licor pyranometer; old SN: PY18400, new SN: PY28170**	ok
8	mean solar flux; outgoing (down-facing) (W/m^2) **Licor pyranometer; SN: PY20562**	ok
9	mean horizontal wind speed (m/s)	ok
10	resultant mean wind speed (m/s)	o1
11	resultant mean wind direction (degrees from north)	ok
12	standard deviation of wind direction (degrees)	ok
13	maximum wind speed (m/s)	ok
14	minimum wind speed (m/s)	ok
15	mean P.A.R. (micromols/s/m^2) **Licor quantum; SN unknown**	Data temporarily excluded
16	mean soil temperature @ 0 cm in soil (C)	rclow
17	mean soil temperature @ 5 cm in soil (C)	rclow
18	mean soil temperature @ 10 cm in soil (C)	rclow
19	sample depth from sensor to surface (cm)	measurement * -100
20	sample of battery voltage	o1

Notes:

- Station visited on 12/19/2019 by W. Gutterman, M. Stone, E. Sicard. All input values looked good.
- Power off at 13:12, power on at 14:13
- Replaced upward facing pyranometer, old SN: PY18400, new SN: PY28170. Also replaced pyranometer mount.
- Replaced Campbell SM4M storage module with same program P8: FRL_201112_v2.dld
- GPS position: (Lat: 77° 36.678, Long: 163° 10.204)
- Need to record quantum sensor SN – data not included until SN and calibration sheet are located.
- Did not add barometer to station - all necessary ports were taken up on the CR10X panel; would have required the use of an 'if-then' statement in the code or the addition of a multiplexer panel
- Camera data was problematic. Downloaded camera data from memory card on Dec. 19. Only 3 months of data written to the card. Changed camera program and wiped card clean. Program updated (In image capture tab under self-timed capture 1, memory usage changed from 10 MB to 16000 MB). Confirmed new program was working on Dec. 20

Friis Hills Met Station (FRSM)

Filename:	FRSM_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	12/18/2018 15:15 to 12/27/2019 13:00
Sampling Frequency:	wind every 4 sec; others: every 30 sec
Averaging and Output Interval:	every 15 min
Program Name:	FRSM_201314_V1.dld

1	array I.D.	o1
2	Year	ok
3	Day	ok
4	Time	ok
5	Mean air temp. @ 2.5 m (C)	ok
6	Mean RH @ 2.5m (%)	lowe correction
7	NetRad (W m^{-2})	ok
8	NetRad (W m^{-2}) Correction	ok
9	Mean horizontal wind speed (m/s)	ok
10	WSpd_U_WVT L	o1
11	Resultant mean wind direction (degrees from north)	ok
12	Standard deviation of wind direction (degrees)	ok
13	Wind Speed Max (m/s)	ok
14	Wind Speed Min (m/s)	ok
15	Pressure (mbar)	ok

Notes:

- Station visited on 12/27/2019 by M. Stone, R. Moyer, and W. Gutterman. All input values looked good.
- Power off at 13:05, power on at 14:34
- Replaced (1) 12V battery and box
- Replaced 3m RH (old SN: U2340043, new SN: U2340002)
- Replaced Anemometer (old SN: WM27761, new SN: 12803)
- Replaced CR10X datalogger (old SN: X14326, new SN: X44861)
- Replaced barometer, old model: PTB010B, SN: Y2440013. New model: PTB110, SN: R0141345
- Replaced Campbell SM4M storage module with new program (old P8: FRSM_201314_V1.dld, new P8: FRSM_201920_V1.dld). New program for barometer upgrade (matching same sampling frequency as Lake Hoare)

New Lake Hoare Met Station (HO2M)

Filename:	HO2M_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	12/17/2018 10:45 to 12/24/2019 14:45
Sampling Frequency:	wind every 4 sec.; others: every 30 sec.
Averaging and Output Interval:	every 15 minutes
Program Name	HOEM_201718_v2.dld

1	array I.D.	o1
2	Year	ok
3	Day	ok
4	Time	ok
5	mean air temp. @ 3 meters (C)	rclow
6	corrected mean R.H. @ 3 meters (%)	lowe correction
7	mean air temp. @ 1 meter (C)	rclow
8	mean solar flux; incoming (up-facing) (W/m2) **Licor pyranometer; new SN: PY28169, old SN: PY23276**	ok
9	mean solar flux; outgoing (down-facing) (W/m2) **Licor pyranometer; new SN PY28370, old SN: PY20561**	ok
10	mean horizontal wind speed (m/s)	ok
11	resultant mean wind speed (m/s)	o1
12	resultant mean wind direction (degrees from north)	ok
13	standard deviation of wind direction (degrees)	ok
14	maximum wind speed (m/s) **RM Young Anemometer; new SN: WM10365, old SN: WM80553**	ok
15	minimum wind speed (m/s)	ok
16	mean P.A.R. (micromols/s/m2) **Licor quantum; SN: Q32567**	divide by 200, multiply by 285.45 (Q32567)
17	mean soil temperature @ 0 cm in soil (C)	rclow
18	mean soil temperature @ 5 cm in soil (C)	rclow
19	mean soil temperature @ 10 cm in soil (C)	rclow
20	Atmospheric pressure	ok
21	d_Temp_AVG	o1
22	sample depth from sensor to surface (cm)	measurement * -100
23	AccRTNRT_TOT	o1
24	AccNRT_TOT	o1
25	AccTotNRT	o1
26	Precip RT_Average	o1
27	Precip NRT	ok
28	Status	o1
29	sample of battery voltage	o1

Notes:

- Station visited on 12/8/2019 by M. Stone, W. Gutterman, and E. Sicard. All input values looked good.
- Power off at 11:16, power on at 13:31
- Replaced upward facing Licor pyranometer, new SN: PY28169, old SN: PY23276
- Replaced downward facing Licor pyranometer, new SN PY28370, old SN: PY20561
- Replaced 3m relative humidity sensor: new SN: V1140041, old SN: W4230016
- Replaced anemometer, new SN: WM10365, old SN: WM80553
- Replaced CR10X, new SN: X23868, old SN: X35782

- Replaced Vaisala PTB110 barometer new SN: R1030609, old SN: N0750442
- Replaced Campbell SM4M storage module with new program (old P8: HOEM_201718_V2.dld, new P8: HOEM_201920v1.dld))
- Replaced SM4M twice; new program both times; SM4M containing P8: HOEM_201920V1.dld – Dec. 9; Did not telemeter the correct data; SM4M containing P8: HOEM_201920V2.dld – Dec. 24 Corrected the telemetry problem
- Manual measurement of ultrasonic 96.5 cm above ground.
- Installed additional battery – Dec. 8; Battery box housing new battery has built in solar panel, but did not know how to connect the battery to that solar panel, so battery is charged using the same solar panels charging the pre-existing batteries. Should replace w a normal battery box next year.
- Downloaded UV data for A. Bergstrom from HO2M – Dec. 8
- Installed new precipitation gauge – Dec. 9, Nipher shield installed – Jan. 6, Brackets for the Nipher shield were missing! Shield was jerry rigged into position. NEED TO PURCHASE NIPHER BRACKETS FOR NEXT YEAR!

Howard Glacier Met Station (HODM)

Filename:	HODM_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	11/27/2018 15:00 to 12/28/2019 09:15
Sampling Frequency:	sonic every 60 min, wind every 4 sec; others: every 30 sec
Averaging and Output Interval:	every 15 minutes
Program Name:	HODM_201314_V1.dld

1	array I.D.	o1
2	Year	ok
3	Day	ok
4	Time	ok
5	mean air temp. @ 3 meters (C)	rclow
6	mean R.H. @ 3 meters (%)	lowe correction
7	mean solar flux; incoming (up-facing) (W/m^2) **Eppley pyranometer; new SN: 32057F3, old SN: 33733F3**	divide by 100; multiply by 121.51 (33733F3)
8	mean solar flux; outgoing (down-facing) (W/m^2) **Eppley pyranometer; new SN: 30884F3**	divide by 100; multiply by 130.04 (30884F3)
9	mean horizontal wind speed (m/s)	ok
10	resultant mean wind speed (m/s)	o1
11	resultant mean wind direction (degrees from north)	ok
12	standard deviation of wind direction (degrees)	ok
13	maximum wind speed (m/s)	ok
14	minimum wind speed (m/s)	ok
15	mean air temp @ 1 m (C)	rclow
16	mean rh @ 1 meter (%)	lowe correction
17	sample depth from sensor to surface (cm)	measured depth * -100
18	sample of battery voltage	o1

Notes:

- Station visited on 12/28/2019 W. Gutterman, M. Stone, and R. Moyer. All input values looked good.
- Power off at 09:27, power on at 10:39
- Replaced Campbell SM4M storage module with same program (P8: HODM_201314_V1.dld)
- Replaced upward facing Eppley Pyranometer, new SN 32057F3
- Wrong calibration sheet in Eppley box?
- Downward Eppley pyranometer measured to be 97.5 cm from ice surface before lowering, 91.5 cm after lowering.
- Lowered station by an average of 13 cm
- Moved batteries: battery box partially submerged in cryoconite hole

Miers Valley Met Station (MISM)

Filename:	MISM_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	12/5/2018 11:15 to 12/2/2019 12:15
Sampling Frequency:	wind every 4 secs.; ultrasonic every 1 hr; others every 30 secs.
Averaging and Output Interval:	every 15 minutes
Program Name	MISM_201112_v1.dld

1	array I.D.	o1
2	year	ok
3	day	ok
4	time	ok
5	mean air temp. @ 3 meters (C)	rclow
6	mean R.H. @ 3 meters (%)	lowe correction
7	mean solar flux; incoming (up-facing) (W/m^2) **Licor pyranometer; SN: PY18656**	ok
8	mean solar flux going up; outgoing (down-facing) (W/m^2) **Licor pyranometer; SN:PY28167**	ok
9	mean horizontal wind speed (m/s)	ok
10	resultant mean wind speed (m/s)	o1
11	resultant mean wind direction (degrees from north)	ok
12	standard deviation of wind direction (degrees)	ok
13	maximum wind speed (m/s) **Anemometer; new SN: WM17809, old SN: WM80545**	ok
14	minimum wind speed (m/s)	ok
15	mean P.A.R. (micromols/s/m^2) **Licor quantum; new SN: 17248, old SN: Q23210**	Divide by 200, multiply by 271.938 (Q23210)
16	mean soil temperature @ 0 cm in soil (C)	rclow
17	mean soil temperature @ 10 cm in soil (C)	rclow
18	pressure (mbars)	ok
19	distance to surface (cm)	ok
20	sample of battery voltage	o1

Notes:

- Station visited on 12/2/2019 by M. Stone, W. Gutterman, and J. Tinker. All input values looked good.
- Power off at 10:33, power on at 11:03
- Replaced Licor quantum PAR sensor (new SN: Q17248)
- Replaced CR10X (new SN: X23866)
- Replaced anemometer (new SN: WM17809)
- Replaced Campbell SM4M storage module with same program (P8: MISM_201112_V1.dld)

Taylor Glacier Met Station (TARM)

Filename:	TARM_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	12/18/2018 14:30 to 12/27/2019 11:00
Sampling Frequency:	depth every 60 minutes, wind every 4 secs.; others: every 30 secs.
Averaging and Output Interval:	every 15 minutes
Program Name	TARM_201112_V1

1	array I.D.	o1
2	Year	o1
3	Day	ok
4	Time	ok
5	mean air temp. @ 3 meters (C)	rclow
6	mean R.H. @ 3 meters (%)	lowe correction
7	mean air temp @ 1m (C)	rclow
8	mean RH at 1m (%)	lowe correction
9	mean solar flux; incoming (pointing up) (W/m^2) – **Eppley pyranometer; SN: 29763F3**	divide by 100; multiply by 128.53 (29763F3)
10	mean solar flux; outgoing (pointing down) (W/m^2) – **Eppley pyranometer; SN: 29762F3**	divide by 100; multiply by 136.99 (29762F3)
11	mean horizontal wind speed (m/s)	ok
12	resultant mean wind speed (m/s)	o1
13	resultant mean wind direction (degrees from north)	ok
14	standard deviation of wind direction (degrees)	ok
15	maximum wind speed (m/s) **Anemometer; SN: WM47856**	ok
16	minimum wind speed (m/s)	ok
17	surface temperature internal thermistor output (mV)	o1
18	surface temperature (mV)	o1
19	surface temperature (C)	ok
20	sample depth from sensor to surface (cm)	multiple by -100
21	sample of battery voltage	ok

Notes:

- Station visited on 12/27/2019 by W. Gutterman, M. Stone, R. Moyer. All input values looked good.
- Power off at 11:11, power on at 12:16
- Relative humidity sensor 3m replaced, new SN: Y2850072, old SN: Y2710027
- Relative humidity sensor 1m replaced, new SN: U2520041, old SN: W4230013
- Replaced anemometer, new SN: 15249, old SN: 47856
- Downward Eppley pyranometer distance to ice 92 cm before lowering station. 61.5 cm to ice after lowering station.
- Ultrasonic ranger transducer replaced
- Replaced Campbell SM4M storage module with same program (P8: TARM_201112_V1.dld)

Lake Vanda Met Station (VAAM)

Filename:	VAAM_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	11/22/2018 12:15 to 12/26/2019 10:15
Sampling Frequency:	wind every 4 secs.; ultrasonic every 1 hr; others every 30 secs.
Averaging and Output Interval:	every 15 minutes
Program Name	VAAM_201112_v1.dld

1	array I.D.	o1
2	day	ok
3	time	ok
4	mean air temp. @ 3 meters (C)	rclow
5	mean R.H. @ 3 meters (%)	lowe correction
6	mean solar flux; incoming (up-facing) (W/m^2) **Licor pyranometer; SN: RMA 27666 Line#22)**	ok
7	mean solar flux going up (W/m^2) **Licor pyranometer; SN: PY33985**	ok
8	mean horizontal wind speed (m/s)	ok
9	resultant mean wind speed (m/s)	o1
10	resultant mean wind direction (degrees from north)	ok
11	standard deviation of wind direction (degrees)	ok
12	maximum wind speed (m/s) **Anemometer; new SN: WM47080, old SN: WM85158**	ok
13	minimum wind speed (m/s)	ok
14	mean P.A.R. (micromols/s/m^2) **Licor quantum; new SN: 29766, old SN: Q20266**	divide by 200, multiply by 279.195 (Q20266)
15	mean soil temperature @ 0 cm in soil (C)	rclow
16	mean soil temperature @ 5 cm in soil (C)	rclow
17	mean soil temperature @ 10 cm in soil (C)	rclow
18	distance to surface (cm)	measured depth * -100
19	sample of battery voltage	ok

Notes:

- Station visited on 12/26/2019 by M. Stone, W. Gutterman and E. Sicard. All input values looked good.
- Power off at 10:17; power on at 11:30
- Replaced quantum PAR sensor, new SN: W29766, old SN: Q20266. Notes say replace entire quantum arm and bracket next year.
- Replaced anemometer, new SN: WM47080, old SN: WM85158
- Replaced CR10X datalogger, new SN: X07336, old SN: X28678
- Replaced Campbell SM4M storage module with same program (P8: VAAM_201112_v1.dld)
- Manual measurement of ultrasonic = 60.5 cm above ground

Lake Vida Met Station (VIAM)

Filename:	VIAM_201920_PROCESSED
Author of this report:	Krista Myers
File Period:	12/19/2018 15:00 to 12/26/2019 13:30
Sampling Frequency:	wind every 4 secs.; ultrasonic every 1 hr; others every 30 secs.
Averaging and Output Interval:	every 15 minutes
Program Name	VIA1213V1.dld

1	array I.D.	o1
2	year	ok
3	day	ok
4	time	ok
5	mean air temp. @ 3 meters (C)	Rclow
6	mean R.H. @ 3 meters (%)	Lowe correction
7	mean solar flux; incoming (up-facing) (W/m^2) **Licor pyranometer; SN: PY23250**	ok
8	mean solar flux; outgoing (down-facing) (W/m^2) **Licor pyranometer; SN: PY25307**	ok
9	mean horizontal wind speed (m/s)	ok
10	resultant mean wind speed (m/s)	o1
11	resultant mean wind direction (degrees from north)	ok
12	standard deviation of wind direction (degrees)	ok
13	maximum wind speed (m/s) **Anemometer; new SN: WM17401, old SN: WM47480**	ok
14	minimum wind speed (m/s)	ok
15	mean P.A.R. (micromols/s/m^2) **Licor quantum; SN: Q29765**	divide by 200, multiply by 156.25 (Q29765)
16	mean soil temperature @ 0 cm in soil (C)	Rclow
17	mean soil temperature @ 5 cm in soil (C)	Rclow
18	mean soil temperature @ 10 cm in soil (C)	Rclow
19	distance to surface (cm)	Measured depth * -100
20	sample of battery voltage	o1

Notes:

- Station visited on 12/26/2019 by M. Stone, W. Gutterman, and E. Sicard. All input values looked good.
- Power off at 13:42, power on at 14:07
- Replaced anemometer, new SN: WM17401, old SN: WM47480
- Replaced Campbell SM4M storage module with same program (P8: VIA1213V1.dld)
- Manual measurement of ultrasonic 60 cm above ground

Appendix

Array ID and date of established date

Array ID	ID	Name	Date of Station Establishment
1	HOEM	Lake Hoare	Dec 1, 1993 by Peter Doran, Retired on Nov 7, 2014 by Maciej Obryk
1A	HO2M	Lake Hoare	Dec 27, 2012 by Thomas Nylen
2	FRLM	Lake Fryxell	Jan 6, 1994 by Peter Doran
3	BOYM	Lake Bonney	November 24, 1993 by Peter Doran
4	COHM	Commonwealth Glacier	November 22, 1993 by Peter Doran
5	HODM	Howard Glacier	November 20, 1993 by Peter Doran
6	TARM	Taylor Glacier	November 21, 1994 by Peter Doran
7	VAAM	Lake Vanda	November 24, 1994 by Peter Doran, moved to new location due to lake level rise on 12/8/2016 (new GPS = -77.52567, 161.69129)
8	BRHM	Lake Brownworth	November 13, 1996 by Peter Doran and DJ Osborne
9	EXEM	Explorer's Cove	Nov 21, 1997 by Peter Doran, DJ Osborne and K. Sauter
10	CAAM	Canada Glacier (without Eddy Sensors)	Nov 20, 1995 by Karen Lewis; reinstalled Jan 13, 1998
11	VIAM	Lake Vida	November 24, 1995 by Peter Doran
12	????	RETIRED Hoare Submerged	???
13	????	RETIRED Fryxell Submerged	???
14	????	RETIRED Bonney East Submerged	???
15	????	RETIRED Canada Gl. (w/ Eddy Sensors)	???
16	????	RETIRED Bonney West Submerged	???
17	F6MM	F6 Snow Fence, Met, and Sensit	Changed to F6 Met and F6 Sensit by Hassan Basagic, retired Dec 2016
18	BENM	RETIRED Beacon Valley	Jan 27, 2000 by Susan Kaspari, Thomas Nylen and Adrian Green. Retired in Dec 2012.
19	LHPM	RETIRED Lake Hoare Precipitatio	January 26, 2002 by Thomas Nylen (also Upper Howard)
19	UHDM	RETIRED Upper Howard Met	Temporary station Retired in 2004.
19	BLDM	RETIRED Blood Falls	Temporary station 11/14/2004
20	BRMM	Bonney Snow Fence	Changed to Bonney Riegel Met and Sensit by Hassan Basagic. Removed 2016.
21	FRSM	Friis Hills	Installed by Cuffey et al., ????; absorbed by LTER.
22	FLMM	Mt. Fleming	Installed 10/16/06 by Univ of Wisc AWS
25	GADM	RETIRED Garwood Valley	Installed by Peter Doran; Removed from service in 2011-12
25	MISM	Miers Valley	Installed by Nylen 2011-12
26	GAFM	Garwood Valley Ice Cliff	December 2010 by Thomas Nylen
27	HTDR	Lake Hoare TDR Station	08-09 Season by Hassan Basagic
92	EXSM	RETIRED Explorers Cove Sensit	Installed by Hassan Basagic; Retired Nov 2012
95	F6SM	F6 Snowfence Sensit	Installed by Hassan Basagic; Retired Dec 2016
96		Lake Fryxell Sensit	Installed by Hassan Basagic, Data combined with Fryxell station data
97		RETIRED Lake Hoare Sensit	Installed by Hassan Basagic, Retired 12/2010
98		RETIRED Lake Bonney Sensit	Installed by Hassan Basagic in 2005/06, Retired 12/2010
99	BRSM	Bonney Reigel Sensit	Installed by Hassan Basagic; removed Dec 2016
102	BRSS	Bonney Reigel Soil Station	
103	F6SS	F6 Soil station	Removed Dec 2016
104	LHS3	LH Soil station 2	
105	LHS4	LH Soil station 4	
112	BRTS	Bonney Reigel Theta Station	
113	F6TS	F6 Soil station	
114	LHS1	Lake Hoare Soil station 1 Theta	1/28/2003
115	LHS2	Lake Hoare Soil station 3 Soil	1/28/2003
119	HJHM	RETIRED Hjorth Hill Met	Installed by Peter Doran; Removed from service